

WHAT IS CLAIMED IS:

1. A giant magnetoresistive element comprising:
  - a first antiferromagnetic layer;
  - 5 a pinned magnetic layer formed on the first antiferromagnetic layer so that the magnetization direction is pinned by an exchange coupling magnetic field with the first antiferromagnetic layer;
  - a nonmagnetic material layer formed on the pinned
  - 10 magnetic layer;
  - a free magnetic layer formed on the nonmagnetic material layer so that the magnetization direction of a central portion changes with an external magnetic field;
  - nonmagnetic layers formed on both side portions of the
  - 15 free magnetic layer in the track width direction;
  - ferromagnetic layers formed on the respective nonmagnetic layers; and
  - second antiferromagnetic layers formed on the respective ferromagnetic layers to align the magnetization direction of
  - 20 each ferromagnetic layer in a direction perpendicular to the magnetization direction of the pinned magnetic layer;
  - wherein at least the free magnetic layer, the nonmagnetic layers and the ferromagnetic layers have continuous end surfaces at both sides in the track width
  - 25 direction.

2. A giant magnetoresistive element according to claim 1, wherein the ratio (FW/FL) of the dimension FW of the free

magnetic layer to the dimension FL of the ferromagnetic layers in the track width direction is 1.1 to 2.0.

3. A giant magnetoresistive element according to claim 5 1, further comprising electrode layers formed in contact with the upper surfaces of the respective second antiferromagnetic layers and contact with the end surfaces of the layers ranging from the antiferromagnetic layers to the pinned magnetic layer at both sides in the track width direction.  
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4. A giant magnetoresistive element according to claim 1, wherein each of the electrode layers comprises a first electrode layer formed in contact with the end surfaces of the layers ranging from the pinned magnetic layer to each 15 second antiferromagnetic layer at each side in the track width direction, and a second electrode layer formed on the first electrode layer and each second antiferromagnetic layer.

5. A giant magnetoresistive element according to claim 20 1, wherein each of the second antiferromagnetic layers comprises a lower antiferromagnetic layer laminated on each ferromagnetic layer, and an upper antiferromagnetic layer, each of the lower antiferromagnetic layers having a thickness of 20 Å to 50 Å.  
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6. A giant magnetoresistive element according to claim 5, wherein the total thickness of each lower antiferromagnetic layer and upper antiferromagnetic layer is

80 Å to 300 Å.

7. A giant magnetoresistive element according to claim  
5, further comprising nonmagnetic protective layers  
5 interposed between the lower antiferromagnetic and upper  
antiferromagnetic layers, each of the nonmagnetic protective  
layers having a thickness of 3 Å or less.

8. A giant magnetoresistive element according to claim  
10 7, wherein a constituent element of the nonmagnetic  
protective layers is mixed in the upper or lower  
antiferromagnetic layers.

9. A giant magnetoresistive element according to claim  
15 7, wherein the constituent element of the nonmagnetic  
protective layers is at least one of Ru, Rh, Pd, Ir, Os, Re,  
Cr, Cu, Pt, and Au.

10. A giant magnetoresistive element according to claim  
20 1, wherein each of the free magnetic layer and the  
ferromagnetic layers comprises any one of a NiFe alloy, Co, a  
CoFe alloy, a CoNi alloy, and a CoFeNi alloy.

11. A giant magnetoresistive element according to claim  
25 1, wherein the free magnetic layer and ferromagnetic layers  
are made of the same magnetic material, and the thickness of  
the ferromagnetic layers is smaller than that of the free  
magnetic layer.

12. A giant magnetoresistive element according to claim  
1, wherein each of the free magnetic layer and ferromagnetic  
layers comprises a single layer, and the free magnetic layer  
5 or ferromagnetic layers, or both the free magnetic layer and  
ferromagnetic layers comprise a CoFeNi alloy.

13. A giant magnetoresistive element according to claim  
1, wherein the free magnetic layer comprises a laminate of a  
10 NiFe alloy layer and a CoFe alloy layer, and each of the  
ferromagnetic layers comprises a laminate of a CoFe alloy  
layer and a NiFe alloy layer.

14. A giant magnetoresistive element according to claim  
15 1, wherein each of the nonmagnetic layers is composed of at  
least one of Ru, Rh, Pd, Ir, Os, Re, Cr, Cu, Pt, and Au.

15. A giant magnetoresistive element according to claim  
1, wherein each of the first antiferromagnetic and/or second  
20 antiferromagnetic layers comprises a PtMn alloy, a X-Mn  
(wherein X is at least one element of Pd, Ir, Rh, Ru, Os, Ni,  
and Fe) alloy, or a Pt-Mn-X' (wherein X' is at least one  
element of Pd, Ir, Rh, Ru, Au, Ag, Os, Cr, Ni, Ar, Ne, Xe,  
and Kr) alloy.

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